SOLID WASTE GUIDE

PUBLISHED BY UNIVERSITY EXTENSION

Hot wheels — Scrap tire recycling

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Every year in the United States, 250 million automobile tires are discarded, presenting a serious disposal problem. Scrap tires take up large amounts of space and are difficult to destroy. The unsightly mounds of tires are flammable and release toxic fumes when burned.

Missouri requires that all tires going to a landfill be shredded, with the end-product no larger than 6-inch chips. If they are discarded in larger sections, scrap tires do not disappear when dumped in landfills, but instead trap air which causes them to slowly push their way to the surface.

This publication is intended to help Missourians comply with state regulations in reducing accumulations of scrap tires. Some potential uses for scrap tires, as well as some businesses that will accept old tires, are provided here.

Other publications of interest:
Scrap Tire News
133 Mountain Road
P.O. Box 714
Suffield, CT 06078
203-668-5422
Product and service exchange aimed at the scrap tire industry. Monthly newsletter covering the news and developments in the scrap tire processing industry.

Energy potential

Chipped scrap tires with varying levels of wire and fabric still contained in the chips have a very high British Thermal Unit (BTU) value compared to other common energy sources. The following table compares the potential of rubber products with other energy sources:

	BTU/lb
coke	13.7
wood	4.375
bituminous coal	12.75
subbituminous coal	10.5
lignite coal	7.3
rubber derivative	**16.0**

Fuel for industrial and utility boilers

TDF (tire-derived fuel) requires users to have agreements on zoning, transmission access, construction and environmental applications from state and local authorities. Some utility companies that have tested or are burning scrap tires are:

- Illinois Power Company
  Decatur, Il
  Baldwin power facility
- Oxford Energy Company
  Moapa, NV
  Modesto, CA
- Ohio Edison Company
  Toronto Plant
- Uniroyal Goodrich
  Eau Claire
- Wisconsin Power & Light Company, using cyclone-fired utility boiler
- Otter Tail Power Company
  Big Stone City, SD
- Monsanto Company
  Wm. G. Krummrich Plant
  Sauget, IL

Highway applications

Recycled rubber is used in asphalt overlays on highways. A reclaimed rubber modified asphalt mixture improves stability, durability, reflective crack reduction, and oxidation resistance. All of this adds up to a mixture with an indicated service life outlasting our conventional mixes. Construction procedures are similar to typical lay-down operations.

Tire retreading

Tire retreading and remanufacturing offers one of the best opportunities to reduce the number of tires requiring disposal. Tire type determines the future life of a tire. Radial passenger tires, unlike the bias tire, are not easily retreaded. New radials require retreaders to retool to state-of-the-art equipment. Generally, low-cost passenger tire imports cannot be retreaded.

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Various potential uses for scrap tires

Potential Uses	Advantages	Disadvantages	Marketable Product
Artificial reefs	Increases fish habitation Long life Ease of configuration	Costly to install May move	Reefs
Breakwaters	Perform well Durable Low cost	Limited number of tires used	Breakwater
Construction	Perform well Low cost	Limited number of tires Used	Retaining walls Erosion control Crash attenuation Structural fill material
Crumb rubber	Marketable commodity Reclaims raw material Marketable applications	High cost	Crumb rubber
Rubberized asphalt	Longer wear Noise buffer	Mixed test results Requires special equipment Not proven economical	Asphalt
Sealants	Proven effective	Limited number of tires used	Roof/road sealant
Railroad crossings	Proven effective Reduces supply	Limited number of tires used	Railroad crossings
Sport surfaces	Better surface Lessens impact	Limited number of tires used	Running tracks Playgrounds
Stampings	Proven effective	Limited number of tires used Not economical Fragmented market	Dock bumpers Farm machinery rollers Pipe rollers
Soil additives	Improves soil quality Improves air circulation	Limited number of tires used Fixed sales for compost	Tire chips
Sheet goods	Proven effective	Limited uses Limited number of tires used	Floor mats, carpet pads Mud guards
Molded products	Wide variety of uses	Saturated market	Truckbed liners Pots, buckets, etc.
Tire retreading	Historically proven Reduction of supply	Declining market	Retreaded tires

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Various potential uses for scrap tires, *continued*

Potential Uses	Advantages	Disadvantages	Marketable Product
Dedicated whole tire boilers	Completely disposes tire Produces energy Appears environmentally clean	Long pay-back period Community acceptance New boiler construction Requires large stockpile for continuous use	Energy
Municipal Solid Waste/ Waste to Energy (MSW/WTE)	Reduction of supply Compatible with existing fuels Can boost BTU content	Limited use Tires may burn too hot Limited MSW/WTE facilities	Energy
Pulp/paper plants	Reduction of supply Compatible with existing fuels Can boost BTU content	Limited use in Illinois Increases air emissions Required stockpiles	Energy
Utility boilers	Reduction of supply Compatible with existing fuels	Requires stockpiles Increases air emissions	Energy
Cement kilns	Reduction of supply Compatible with existing fuels	Requires clean TDF	Energy
Fluidized bed boilers	Reduction of supply Compatible with existing fuels	Requires clean TDF Requires stockpiles Increases air emissions	Energy
Pyrolysis	Minimal environmental impacts anticipated	Unproven markets Requires stockpiles	Oil and combustible gas Carbon black

Examples of companies involved in scrap tires*

■ R&S Recycling, Inc.
Schriever, LA
Markets a complete line of tire pots containing 75 percent post-consumer recycled tire materials for industrial, agricultural and household use.

■ Lakin General Tire
Chicago, IL
Produces retread and remanufactured tires for Sears catalog sales. Under trade name TICOR, manufactures a wide variety of die-cut parts made from scrap tires such as tailpipe hangers, snowblower blades, conveyor rollers and cornhusking rollers.

■ University of Florida Building Construction Industry Advisory Committee
Conducting research on old tires in roofing materials. Project title is "A Study to Determine Ways to Use Ground Rubber from Used Tires in Roofing Materials and Any Other Construction Products."

■ Products to Oil, Inc. (PTO)
Springdale, AR
Pyrolysis of tires to oil and carbon black

■ Durable Materials Company
25 N. Pleasant Street
Norwalk, OH 44857
Offers rugged, economical culvert piping manufactured from steel and nylon-reinforced truck tire beads.

■ Ag Products Terminal Company
Clayton, IA
Uses a former silica sand mine for an underground tire recycling and storage plant.

■ High Tech Recycling Systems Corp., Portland, OR
Gasification system that recycles tires into oil, carbon black and various gases.

■ Energy Products of Idaho (EPI)
Developed pilot plant with a fluid bed design to efficiently convert tires into usable energy in a clean environmentally sound manner. EPI has obtained permits for two energy systems fired entirely on tires.

■ DOT Recycling Systems, Inc.
Fort Wayne, IN

*This is only a partial list and is not an endorsement.

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Shredding scrap tires

For many uses of scrap tires, some shredding is required before they can be processed into marketable products. Capital costs for various types of equipment are listed below. (Note: this is a representative sample of costs and output. It is not a complete list of all manufacturers, and is not intended as an endorsement of any equipment listed here.)

Shredder Type/ Manufacturer	Estimated Cost[1] (000's)	System Configuration[2]	Estimated Throughput[3] (tons/hour)	Chip Size[4]
Replaceable Cutter/				
Columbus	$500-525	Portable	12-13	RS
McKinnon	$435-460	Stationary	8-10	2"
			4-5	1"
Triple/S Dynamics	$550-575	Portable	12-13	RS
	$400-425	Stationary	8-10	2"
			4-5	1"
Rotary Shear/				
Eidal	$375-400	Portable	10-12	RS
	$290-315	Stationary	6-8	2"
			3-4	1"
ERS	$500-525	Portable	12-13	RS
	$425-450	Stationary	8-10	2"
			3-4	1"
Mac-Saturn	$400-425	Portable	10-12	RS
	$340-365	Stationary	6-8	2"
			3-4	1"
Mitts & Merrill	$375-400	Portable	8-10	RS
(Carthage)	$250-275	Stationary	5-7	2"
			2½ - 3	1"
Shredding Systems	$450-475	Portable	10-12	RS
	$375-400	Stationary	6-8	2"
			3-4	1"

Notes

General: Portable systems are self-contained with diesel generator; systems include conveyors, sizing device (typically a disc screen) and magnetic for l" minus chip production; l" minus chip throughputs are estimates based on limited experience.

[1]Costs are estimated; will vary for each application; costs do not include recent price increases that may have occurred.

[2]"Portable": assumes 1 trailer w/diesel generator
"Stationary" assumes electric power is available on site.

[3]Estimated throughput in tons/hour;

[4]RS = Rough Shred throughput, one pass through cutters; 2" = chip size of 2 inches or less; 1" = chip size of 1 inch or less.

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■ ITEC, Inc.
3602 Elida Road
Lima, OH 45807
800-727-2029
Designed to reclaim tire materials for recycling operations. Produces a clean rubber product by separating the tire bead and removing the metal belting through a mechanical process, reclaiming rubber, metal belting and nylon materials from 1,500 tires for an 8-hour shift. Price for the base systems begins at $560,000 turn-key installations. Operations and maintenance training and system warranty are included.

■ Waste Company Generation Technology Corp., Norwalk, CT
203-838-1023
Distributor for the Daito-Sanshin antipollution incinerators for on-site tire disposal. The company offers an automatically programmed and controlled tire incinerator system that can meet all environmental rules and regulations without noxious fumes or smoke.

■ North American Crumb, Inc.
1345 Monroe, NW
Grand Rapids, MI 49505
616-451-9799
Process to grind scrap tires into crumb and powdered rubber using cryogenic technology.

■ Edal International Sales Corp.
P.O. Box 348, 7247 Lake Bluff Court
Wilsonville, OR 97070
503-694-2655
Industrial shredders, crushers, pulverizers and material handling equipment.

■ International Tire Mgt., Inc. (ITM)
Rome, NY
Manufactures high-density tire baler that reduces total volume by approximately 80 percent.

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